

What is claimed is:

1. A composition of matter, comprising:

5 a molecularly compact polymer-ligand conjugate capable of self-orienting on a surface, wherein said molecularly compact polymer comprises a fifth-generation (G5) polyamidoamine dendrimer having surface functional groups, wherein said surface functional groups comprise about 75% hydroxyl groups and about 25% primary amine groups, and wherein said ligand is selected from the group consisting of T-helper cell
10 CD4 molecule, Fc receptor, Acetylcholine receptor (AChR), T cell receptor for antigen, insulin receptor, hormone receptor, antibodies, antibody fragments, IgG molecules, Fab antibody molecules, polypeptides, DNA fragments, RNA fragments, hormones, insulin, hCG, enzymes, sialic acid, porphyrins, and nucleotides, and wherein said ligand is bound to said molecularly compact polymer and said molecularly compact polymer binds to said
15 surface such that said ligand is substantially uniformly positioned opposite said surface.

2. The composition of matter of claim 1, wherein said ligand is selected from the group consisting of IgG molecules and Fab antibody molecules.

- 20 3. The composition of matter of claim 1, wherein said surface is selected from the group consisting of immunoassay test strips, glass, nitrocellulose, paper, quartz, plastics, colloidal particles, metals, polymer latex beads, clays, ceramics, up-converting phosphorescent particles, and quantum dots.

- 25 4. The composition of matter of claim 3, wherein said colloidal particles are selected from the group consisting of colloidal gold, colloidal silver, and colloidal platinum.

5. The composition of matter of claim 4, wherein said colloidal gold particles have a diameter in the range of from about 10 nm to about 80 nm.
6. The composition of matter of claim 5, wherein said colloidal gold particles have a diameter in the range of from about 45 nm to about 65 nm.
7. The composition of matter of claim 3, wherein said quantum dots are nanometer sized inorganic particles.
8. The composition of matter of claim 7, wherein said quantum dots are selected from the group consisting of cadmium sulfide, cadmium selenide, and zinc sulfide.
9. The composition of matter of claim 1, wherein said G5 polyamidoamine dendrimer is of about 5.4 nm in diameter.
10. The composition of matter of claim 1, wherein said molecularly compact polymer-ligand conjugate is used on a lateral flow immunoassay test strip, said test strip having a membrane surface, a conjugate release pad, and an absorbent pad.
11. The composition of matter of claim 10, wherein said molecularly compact polymer-ligand conjugate is bound to a colloidal gold particle and is used as a reporter ligand on said conjugate release pad.

12. The composition of matter of claim 10, wherein said molecularly compact polymer-ligand conjugate is used as a capture ligand on said membrane surface.

13. A composition of matter, comprising:

5 a molecularly compact polymer-ligand conjugate capable of self-orienting on a surface,
wherein said molecularly compact polymer comprises a sixth-generation (G6) to tenth-
10 generation (G10) polyamidoamine dendrimer having surface functional groups, wherein
said surface functional groups comprise greater than about 75% hydroxyl groups and less
than about 25% primary amine groups, and wherein said ligand is selected from the group
consisting of T-helper cell CD4 molecule, Fc receptor, Acetylcholine receptor (AChR), T
cell receptor for antigen, insulin receptor, hormone receptor, antibodies, antibody
15 fragments, IgG molecules, Fab antibody molecules, polypeptides, DNA fragments, RNA
fragments, hormones, insulin, hCG, enzymes, sialic acid, porphyrins, and nucleotides,
and wherein said ligand is bound to said molecularly compact polymer and said
molecularly compact polymer binds to said surface such that said ligand is substantially
uniformly positioned opposite said surface.

14. The composition of matter of claim 13, wherein said ligand is selected from the group
consisting of IgG and Fab antibody molecules.

15. The composition of matter of claim 13, wherein said surface is selected from the group
consisting of immunoassay test strips, glass, nitrocellulose, paper, quartz, plastics,
colloidal particles, metals, polymer latex beads, clays, ceramics, up-converting
phosphorescent particles, and quantum dots.

16. The composition of matter of claim 15, wherein said colloidal particles are selected from the group consisting of colloidal gold, colloidal silver, and colloidal platinum.

17. The composition of matter of claim 16, wherein said colloidal gold particles have a diameter in the range of from about 10 nm to about 80 nm.

18. The composition of matter of claim 17, wherein said colloidal gold particles have a diameter in the range of from about 45 nm to about 65 nm.

19. The composition of matter of claim 15, wherein said quantum dots are nanometer sized inorganic particles.

20. The composition of matter of claim 19, wherein said quantum dots are selected from the group consisting of cadmium sulfide, cadmium selenide, and zinc sulfide.

21. The composition of matter of claim 13, wherein said G6 to G10 polyamidoamine dendrimers have diameters of about 6.7 nm to about 13.8 nm.

22. The composition of matter of claim 13, wherein said molecularly compact polymer-ligand conjugate is used on a lateral flow immunoassay test strip, said test strip having a membrane surface, a conjugate release pad, and an absorbent pad.

23. The composition of matter of claim 22, wherein said molecularly compact polymer-ligand

conjugate is bound to a colloidal gold particle and is used as a reporter ligand on said conjugate release pad.

24. The composition of matter of claim 22, wherein said molecularly compact polymer-ligand conjugate is used as a capture ligand on said membrane surface.

25. A composition of matter, comprising:

a molecularly compact polymer-ligand conjugate capable of self-orienting on a surface, wherein said molecularly compact polymer comprises a first-generation (G1) to second-generation (G2) polyamidoamine dendrimer having surface functional groups, wherein said surface functional groups comprise less than about 20% hydroxyl groups and greater than about 80% primary amine groups, and wherein said ligand is selected from the group consisting of T-helper cell CD4 molecule, Fc receptor, Acetylcholine receptor (AChR), T cell receptor for antigen, insulin receptor, hormone receptor, antibodies, antibody fragments, IgG molecules, Fab antibody molecules, polypeptides, DNA fragments, RNA fragments, hormones, insulin, hCG, enzymes, sialic acid, porphyrins, and nucleotides, and wherein said ligand is bound to said molecularly compact polymer and said molecularly compact polymer binds to said surface such that said ligand is substantially uniformly positioned opposite said surface.

26. The composition of matter of claim 25, wherein said ligand is selected from the group consisting of Fab antibody molecules and polypeptide molecules.

27. The composition of matter of claim 25, wherein said surface is selected from the group consisting of immunoassay test strips, glass, nitrocellulose, paper, quartz, plastics, colloidal particles, metals, polymer latex beads, clays, ceramics, up-converting phosphorescent particles, and quantum dots.

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28. The composition of matter of claim 27, wherein said colloidal particles are selected from the group consisting of colloidal gold, colloidal silver, and colloidal platinum.

29. The composition of matter of claim 28, wherein said colloidal gold particles have a diameter in the range of from about 10 nm to about 80 nm.

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30. The composition of matter of claim 29, wherein said colloidal gold particles have a diameter in the range of from about 45 nm to about 65 nm.

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31. The composition of matter of claim 27, wherein said quantum dots are nanometer sized inorganic particles.

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32. The composition of matter of claim 31, wherein said quantum dots are selected from the group consisting of cadmium sulfide, cadmium selenide, and zinc sulfide.

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33. The composition of matter of claim 25, wherein said G1 to G2 polyamidoamine dendrimers have a diameter of about 2.2 nm to about 2.9 nm.

34. The composition of matter of claim 25, wherein said molecularly compact polymer-ligand

conjugate is used on a lateral flow immunoassay test strip, said test strip having a membrane surface, a conjugate release pad, and an absorbent pad.

35. The composition of matter of claim 34, wherein said molecularly compact polymer-ligand conjugate is bound to a colloidal gold particle and is used as a reporter ligand on said conjugate release pad.

36. The composition of matter of claim 34, wherein said molecularly compact polymer-ligand conjugate is used as a capture ligand on said membrane surface.

37. A composition of matter, comprising:

a molecularly compact polymer-ligand conjugate capable of self-orienting on a surface, wherein said molecularly compact polymer comprises a third-generation (G3) to fourth-generation (G4) polyamidoamine dendrimer having surface functional groups, wherein said surface functional groups comprise less than about 50% hydroxyl groups and greater than about 50% primary amine groups, and wherein said ligand is selected from the group consisting of T-helper cell CD4 molecule, Fc receptor, Acetylcholine receptor (AChR), T cell receptor for antigen, insulin receptor, hormone receptor, antibodies, antibody fragments, IgG molecules, Fab antibody molecules, polypeptides, DNA fragments, RNA fragments, hormones, insulin, hCG, enzymes, sialic acid, porphyrins, and nucleotides, and wherein said ligand is bound to said molecularly compact polymer and said molecularly compact polymer binds to said surface such that said ligand is substantially uniformly positioned opposite said surface.

38. The composition of matter of claim 37, wherein said ligand is selected from the group consisting of IgG molecules and Fab antibody molecules.

39. The composition of matter of claim 37, wherein said surface is selected from the group consisting of immunoassay test strips, glass, nitrocellulose, paper, quartz, plastics, colloidal particles, metals, polymer latex beads, clays, ceramics, up-converting phosphorescent particles, and quantum dots.

40. The composition of matter of claim 39, wherein said colloidal particles are selected from the group consisting of colloidal gold, colloidal silver, and colloidal platinum.

41. The composition of matter of claim 40, wherein said colloidal gold particles have a diameter in the range of from about 10 nm to about 80 nm.

42. The composition of matter of claim 41, wherein said colloidal gold particles have a diameter in the range of from about 45 nm to about 65 nm.

43. The composition of matter of claim 39, wherein said quantum dots are nanometer sized inorganic particles.

44. The composition of matter of claim 43, wherein said quantum dots are selected from the group consisting of cadmium sulfide, cadmium selenide, and zinc sulfide.

45. The composition of matter of claim 37, wherein said G3 to G4 polyamidoamine dendrimers have a diameter of about 3.6 nm to about 4.5 nm.

46. The composition of matter of claim 37, wherein said molecularly compact polymer-receptor conjugate is used on a lateral flow immunoassay test strip, said test strip having a membrane surface, a conjugate release pad, and an absorbent pad.

5 47. The composition of matter of claim 46, wherein said molecularly compact polymer-ligand conjugate is bound to a colloidal gold particle and is used as a reporter ligand on said conjugate release pad.

10 48. The composition of matter of claim 46, wherein said molecularly compact polymer-ligand conjugate is used as a capture ligand on said membrane surface.

15 49. A composition of matter, comprising:

a molecularly compact polymer-ligand conjugate capable of self-orienting on a surface, wherein said molecularly compact polymer comprises a fifth-generation (G5) polyamidoamine dendrimer having surface functional groups, wherein said surface functional groups comprise about 75% hydroxyl groups and about 25% primary amine groups, and wherein said ligand is selected from the group consisting of antibodies, antibody fragments, Fab antibody molecules, polypeptides, DNA fragments, RNA fragments, enzymes, sialic acid, porphyrins, nucleotides, and IgG molecules, and wherein said ligand is bound to said molecularly compact polymer and said molecularly compact polymer binds to said surface such that said ligand is substantially uniformly positioned opposite said surface, and wherein said surface comprises colloidal gold particles.

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50. The composition of matter of claim 49, wherein said molecularly compact polymer-receptor conjugate is used on a lateral flow immunoassay test strip.

51. A composition of matter, comprising:

5 a molecularly compact polymer-ligand conjugate capable of self-orienting on a surface,
wherein said molecularly compact polymer comprises a polyethyleneimine dendrigraft
polymer and wherein said ligand is selected from the group consisting of T-helper cell
CD4 molecule, Fc receptor, Acetylcholine receptor (AChR), T cell receptor for antigen,
insulin receptor, hormone receptor, antibodies, antibody fragments, IgG molecules, Fab
10 antibody molecules, polypeptides, DNA fragments, RNA fragments, hormones, insulin,
hCG, enzymes, sialic acid, porphyrins, and nucleotides, and wherein said ligand is bound
to said molecularly compact polymer and said molecularly compact polymer binds to said
surface such that said ligand is substantially uniformly positioned opposite said surface.

15 52. The composition of matter of claim 51, wherein said polyethyleneimine dendrigraft
polymer comprises a generation 0 (G0) to generation 5 (G5) dendrigraft polymer.

53. The composition of matter of claim 52, wherein said polyethyleneimine dendrigraft
polymer comprises a generation 3 (G3) dendrigraft.

20 54. The composition of claim 51, wherein said surface is selected from the group consisting
of immunoassay test strips, glass, nitrocellulose, paper, quartz, plastics, colloidal
particles, metals, polymer latex beads, clays, ceramics, up-converting phosphorescent
particles, and quantum dots.

55. The composition of claim 54, wherein said colloidal particles are selected from the group consisting of colloidal gold, colloidal silver, and colloidal platinum.

56. The composition of matter of claim 55, wherein said colloidal gold particles have a diameter in the range of from about 10 nm to about 80 nm.

57. The composition of matter of claim 56, wherein said colloidal gold particles have a diameter in the range of from about 45 nm to about 65 nm.

58. The composition of matter of claim 54, wherein said quantum dots are nanometer sized inorganic particles.

59. The composition of matter of claim 58, wherein said quantum dots are selected from the group consisting of cadmium sulfide, cadmium selenide, and zinc sulfide.

60. The composition of matter of claim 51, wherein said molecularly compact polymer-ligand conjugate is used on a lateral flow immunoassay test strip, said test strip having a membrane surface, a conjugate release pad, and an absorbent pad.

61. The composition of matter of claim 60, wherein said molecularly compact polymer-ligand conjugate is bound to a colloidal gold particle and is used as a reporter ligand on said conjugate release pad.

62. The composition of matter of claim 61, wherein said molecularly compact polymer-ligand conjugate is used as a capture ligand on said membrane surface.

63. A composition of matter, comprising:

5 a molecularly compact polymer-ligand conjugate capable of self-orienting on a surface,
wherein said molecularly compact polymer comprises a third-generation (G3, PA32) to
fourth-generation (G4, PA64) polypropyleneimine dendrimer having surface functional
groups, wherein said surface functional groups comprise less than about 50% hydroxyl
groups and greater than about 50% primary amine groups, and wherein said ligand is
10 selected from the group consisting of T-helper cell CD4 molecule, Fc receptor,
Acetylcholine receptor (AChR), T cell receptor for antigen, insulin receptor, hormone
receptor, antibodies, antibody fragments, IgG molecules, Fab antibody molecules,
polypeptides, DNA fragments, RNA fragments, hormones, insulin, hCG, enzymes, sialic
acid, porphyrins, and nucleotides, and wherein said ligand is bound to said molecularly
15 compact polymer and said molecularly compact polymer binds to said surface such that
said ligand is substantially uniformly positioned opposite said surface.

64. The composition of matter of claim 63, wherein said ligand is selected from the group
consisting of Fab antibody molecules and IgG molecules.

65. The composition of matter of claim 63, wherein said surface is selected from the group
consisting of immunoassay test strips, glass, nitrocellulose, paper, quartz, plastics,
colloidal particles, metals, polymer latex beads, clays, ceramics, up-converting
phosphorescent particles, and quantum dots.

66. The composition of matter of claim 65, wherein said colloidal particles are selected from the group consisting of colloidal gold, colloidal silver, and colloidal platinum.

67. The composition of matter of claim 66, wherein said colloidal gold particles have a diameter in the range of from about 10 nm to about 80 nm.

68. The composition of matter of claim 67, wherein said colloidal gold particles have a diameter in the range of from about 45 nm to about 65 nm.

69. The composition of matter of claim 65, wherein said quantum dots are nanometer sized inorganic particles.

70. The composition of matter of claim 69, wherein said quantum dots are selected from the group consisting of cadmium sulfide, cadmium selenide, and zinc sulfide.

71. The composition of matter of claim 63, wherein said G3 to G4 polypropyleneamine dendrimers have a diameter of about 3 nm to about 4 nm.

72. The composition of matter of claim 63, wherein said molecularly compact polymer-ligand conjugate is used on a lateral flow immunoassay test strip, said test strip having a membrane surface, a conjugate release pad, and an absorbent pad.

73. The composition of matter of claim 72, wherein said molecularly compact polymer-ligand conjugate is bound to a colloidal gold particle and is used as a reporter ligand on said

conjugate release pad.

74. The composition of matter of claim 72, wherein said molecularly compact polymer-ligand conjugate is used as a capture ligand on said membrane surface.

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